CITY OF STOCKTON

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June 24, 2004

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CITY OF STOCKTON REVIEW COMMENTS ON THE MAY 24 2004 DRAFT FINAL STAFF REPORT AND BASIN PLAN AMENDMENTS FOR THE DWSC DO TMDL

The City recognizes that many of the comments sent on May 14, 2004 about the Draft Staff Report have been incorporated into the Draft Final Report. There are a few very important additional issues, comments and questions which the City believes should be addressed.

It is our understanding that written responses to the questions raised in this memo will be incorporated in the Administrative Record. For our records City staff respectfully request copies of the responses.

Please contact Stephen Gittings, Deputy Director/Wastewater at (209) 937-8781 or contact by E-mail at steve.gittings@ci.stockton.ca.us if you require further assistance or clarification.

Stephen Gittings

for MARK J. MADISON
DIRECTOR OF MUNICIPAL UTILITIES

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cc: Russ Brown, Jones & Stokes

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Review Comments and Questions on the May 24 2004 Draft Final Staff Report and Basin Plan Amendments for the DWSC DO TMDL

Load Allocation Diagram

The main diagram used to describe and evaluate the loading that contributes to the observed DO depletion in the Stockton DWSC is shown in the executive summary (1.1) and in the Wasteload and Load Allocation section (4.5). The City believes that too much important information and concepts have been combined into this single diagram. The TMDL would be more clearly described by referring to three separate TMDL loading "buckets". The recommended diagram with three TMDL loading buckets is illustrated in Figure 1 and described in the following paragraphs.

The first TMDL loading bucket represents the "historical" loading conditions that might have existed years ago prior to the dredging of the DWSC, and preceding substantial diversions of SJR flows upstream of Vernalis or at the head of Old River (caused by the CVP and SWP export pumping). While it is important to realize that loads, flows, and geometry changes each contribute to the observed depletion of DO levels in the DWSC and at times to concentrations below the established DO objectives. However, we are unable to accurately estimate how large this "historical" loading bucket might have been.

The second TMDL loading bucket is the "existing" DWSC loading bucket. This bucket represents the current loading conditions that will be managed with the DO TMDL in order to meet DO objectives in the DWSC. This is the focus of the TMDL load identification, allocation, and reduction efforts. This bucket represents the actual DWSC loadings that can be measured and managed. The loading capacity (LC) identified in equation (4-1) should refer to the existing DWSC loading conditions, and not the historical loading conditions. All of the existing LC can be properly allocated including a moderate margin of safely (MOS), between Stockton's RWCF loading and upstream river loads.

The third TMDL loading bucket is the "excess" DWSC loading bucket. This bucket represents excess loading that causes the observed DO depletion to drop below the established DO objective. The magnitude of this excess DO depletion load is generally much smaller than the total DO depletion observed. Only this excess loading bucket must be controlled by the TMDL load reduction measures. The responsibility for these load reductions should be fully assigned and proportioned to the parties responsible for the three contributing factors (i.e., loads, reduced flows, deepened DWSC).

We suggest that you show these three buckets illustration on the same page in order to clarify historic and existing loading conditions. The historical conditions bucket is larger than the existing conditions bucket and much larger than the excess loading bucket that must be eliminated with the TMDL.

Difference Between Salt and BOD Loads

The difference between salt loads and BOD loads needs clarification. BOD loads are generally measured to decay or oxidize at a maximum rate of about 10% per day. Figure 2 is suggested as a helpful addition to the staff report or presentation materials. If 1000 pounds of salt is poured into the DWSC, the salt load can be immediately detected as increased TDS concentrations and by increased EC values. However, if 1000 pounds of BOD (i.e., corn syrup) were to be poured into the DWSC, the BOD loading would only slowly deplete the DO concentration in the DWSC. During the first day, approximately 100 pounds of DO would be missing, and the second day another 100 pounds of DO would be missing. Some of the BOD load will pass through the DWSC and move downstream of the lowest DO concentration (DO sag) and not contribute to the DO depletion in the DWSC.

Loads, DO Depletions, and Excess DO Depletion

The TMDL must be formulated using the existing DWSC with existing flows and existing loads. This is the TMDL bucket: the loading capacity, oxygen demand load exerted, and excess load can be calculated from real field measurements. The attached Table 1 provides an example of the calculations of the monthly average river loads and RWCF loads, as well as the DO depletions observed in the DWSC during 2001.

The Staff report (page 47) describes the difficulty of translating the allowable DO depletion (NOD) into an ultimate BOD load allocation, because only a portion of the BOD load will be exerted within the DWSC. The data from 2001 suggests that the ultimate BOD loading will likely be at least twice as large as the allowable DO depletion because less than half of the loads were actually oxidized or decayed within the DWSC. This fraction depends on the oxidation rate and the travel time to the lowest DO concentration within the DWSC. The loads can also be higher because some of the loads will be compensated for by natural re-aeration within the DWSC. An initial estimate of 3,000 lb/day is suggested in Table 1.

The excess loading (ENOD) is usually less than 10,000 lb/day and as a monthly average was less than about 5,000 lb/day in the DWSC during 2001. Aeration or oxygenation should be able to compensate for some of the excess loading.

Variations in the TMDL Load Allocations

The staff report does mention that the DWSC loading conditions and corresponding load allocations will change with time, but the expected procedures for measuring and adaptively managing these loading conditions is not described in the Basin Plan Amendment language. The fact that the TMDL oxygen demand loads vary each day with flows and river loading and RWCF discharge conditions should be introduced at the beginning. This is a dynamic TMDL allocation process that will require frequent monitoring and an adaptive management approach.

The SJR salt TMDL has been written with a basic monthly allocation scheme, with an additional "real-time allocation" procedure. Something similar should be described for the DO TMDL. Some responsibility for monitoring of DO and loading conditions (i.e., RWCF and river concentrations) should be assigned.

Questions for RWQCB Staff Responses

- Does staff agree that the three different loading buckets helps to clarify these three aspects of the overall TMDL identification, allocation, and reduction measures?
- Does the calculation of the allowable loading into the DWSC (LC) properly belong at the top of the second bucket, representing existing DWSC conditions?
- Can the full LC of the existing DWSC be assigned to loads from the river or discharges, with a small MOS reserved for measurement uncertainty?
- Should the allocation equations (4-3) to (4-6) be changed if the LC applies to the existing loading conditions?
- If the LC applies to the existing DWSC conditions, isn't a 40% MOS an overly conservative margin of safety? [This would be equivalent to allowing the summer DO to decline only from 8 mg/l to 6.2 mg/l rather than to the established objective of 5 mg/l].
- Should responsibility for eliminating the entire excess oxygen depletion (ENOD) be assigned to contributing parties?
- Should responsibility for removing the ENOD be proportional to the contributions from the factors or from the identified loading?
- Is the MOS for the ENOD in equation (4-8) different from the MOS in equation (4-2)? [These MOS factors appear to be additive, and only one is needed].

- Will daily measurements of flows, concentrations, and corresponding loads and DO depletions be required? Who will be responsible for these measurements and reporting to the RWQCB?

- Would DO credits that may be achieved with flow changes, load reductions, and aeration facilities be calculated and tracked with some established web-based modeling and reporting system?

Figure 2. BOD Loads Have a Delayed Effect on DO Concentrations in the DWSC

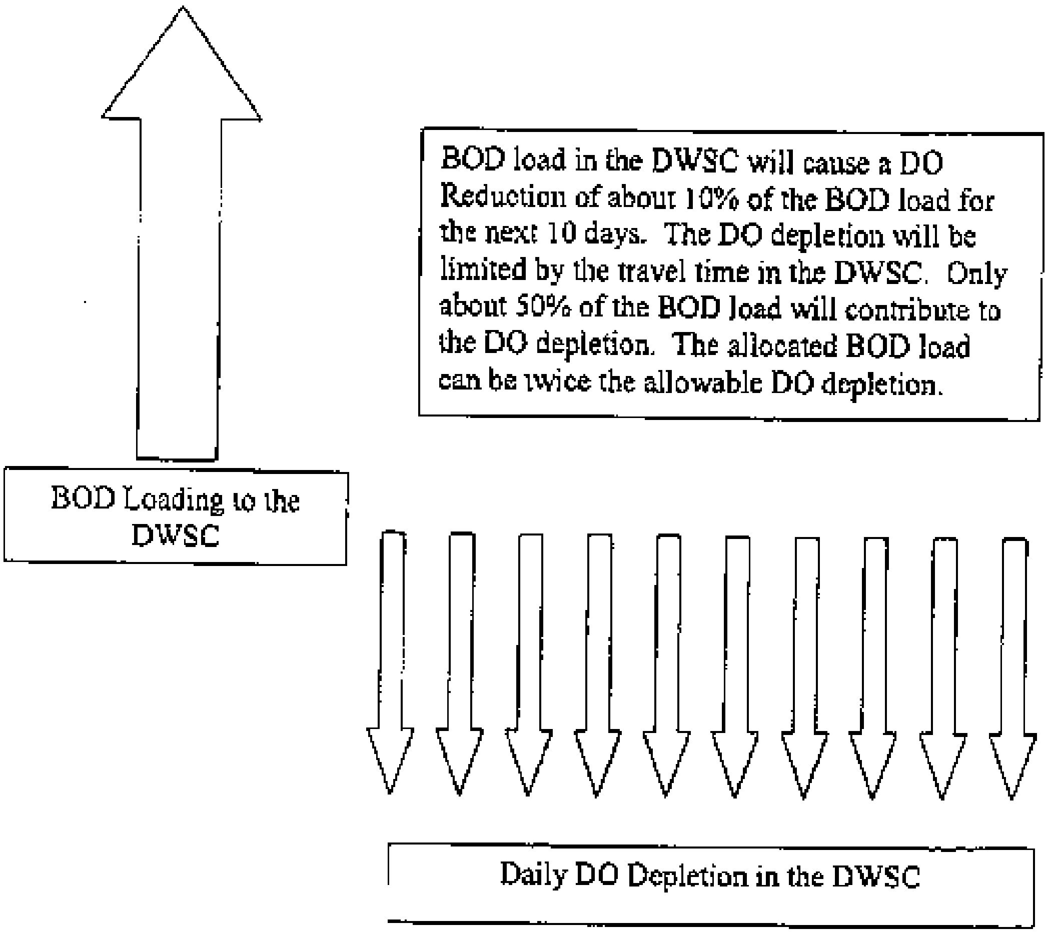
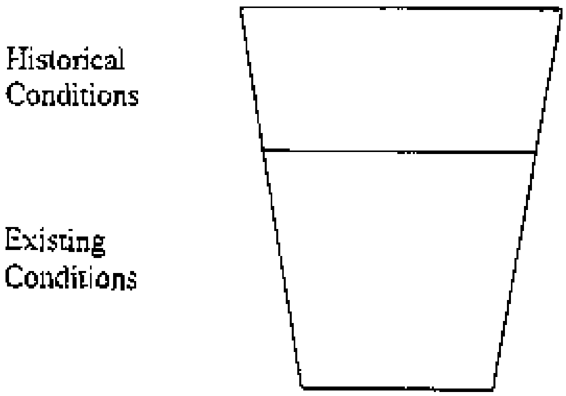


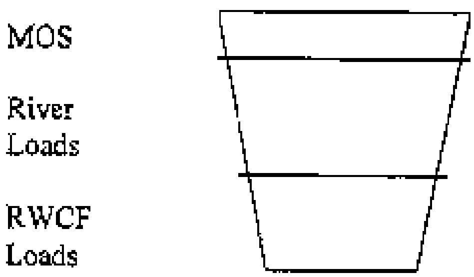
Figure 1. The Three Loading Buckets for the TMDL Identification, Allocation, and Reduction Process



A. Historical Loading Conditions:

- Higher Natural Flows
- Shallower River Channel Geometry
- Natural River Algae Biomass

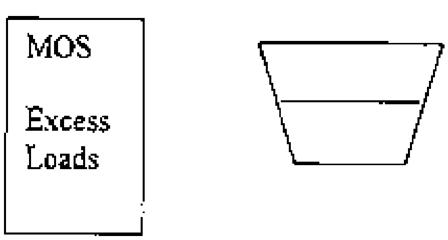
Higher than existing Loading Capacity



B. Existing DWSC Loading Conditions

- MOS to protect the DO objective (20%)
- Reduced DWSC Flows
- Higher River Algae Biomass?
- Stockton RWCF Loads

TMDL for Existing DWSC Loading Capacity



C. Excess Loads Causing Excess DO Depletion

- Load reduction must be greater than excess DO depletion (MOS)
- Responsibility should be apportioned to include all contributing factors
- Aeration can reduce the excess DO depletion

TMDL Monitoring and Reporting Required

Table 1. Estimate of DWSC Loads and DO Depletions for 2001

	January	February	March	April	May	June	July	August	September	October	November	December
Measured River and RWCF BOD Ultimate Loads												
SJR at Vernalis Flow (cfs)	2,458	3,129	3,559	3,079	3,643	1,623	1,404	1,340	1,380	1,891	2,063	2,101
DWSC River Flow (cfs)-Low Estimate	729	998	1,167	1,566	2,419	482	419	401	417	1,347	1,170	299
DWSC River Flow (cfs)-High Estimate	896	1,204	1,359	1,834	3,187	964	838	802	833	1,661	1,425	550
Stockton RWCF Discharge (cfs)	51	43	44	44	45	42	42	52	47	44	47	53
DWSC Travel Time to R&RI (days)-Low Flow	3.2	2.4	2.1	1.6	1.0	4.8	5.5	5.6	5.4	1.8	2.1	7.2
DWSC Travel Time to R&RI (days)-High Flow	2.7	2.0	1.8	1.3	0.8	2.5	2.9	3.0	2.9	1.5	1.7	4.2
River VSS Concentration (mg/l)	2.2	3.5	5.6	8.2	10.4	11.8	11.8	10.5	8.3	5.7	3.5	2.2
River Load- Low Flow	8,838	18,785	35,514	69,371	136,357	30,609	26,677	22,730	18,660	41,601	22,050	3,589
River Load -High Flow	10,862	22,663	41,357	81,243	179,648	61,218	53,354	45,459	37,275	51,299	26,856	6,601
RWCF TSS Concentration (mg/l)	10.1	14.5	14.9	8.9	4.5	5.3	6.0	10.8	10.2	9.0	13.4	15.1
RWCF NH3 Concentration (mg/l)	24.8	24.3	14.7	4.3	7.9	7.2	10.8	12.1	9.4	19.1	16.1	11.5
RWCF BOD Load [from TSS] (lb/day)	2,803	3,351	3,500	2,100	1,091	1,191	1,345	3,003	2,578	2,158	3,415	4,289
RWCF BOD Load [from Ammonia] (lb/day)	30,976	25,273	15,539	4,566	8,619	7,278	10,891	15,143	10,690	20,607	18,466	14,699
Total BOD Load to DWSC (lb/day)-Low Flow	42,617	47,409	54,552	76,037	146,067	39,078	38,913	40,876	31,928	64,367	43,931	22,577

Total BOD Load to DWSC (lb/day)-High Flow	44,641	51,287	60,395	87,909	189,359	69,687	65,589	63,605	50,543	74,064	48,737	25,589
RWCF Fraction of DWSC Load (NH3 + Ult)-Low Flow	0.79	0.60	0.35	0.09	0.07	0.22	0.31	0.44	0.42	0.35	0.50	0.84
RWCF Fraction of DWSC Load (NH3 + Ult)-High Flow	0.76	0.56	0.32	0.08	0.05	0.12	0.19	0.29	0.26	0.31	0.45	0.74
Measured DWSC DO Depletions												
Avg. Temp. (deg. C)	9.0	10.4	14.5	17.5	22.0	24.9	26.0	25.7	23.8	19.8	15.5	10.6
Avg. DO Sat. (mg/l)	11.6	11.2	10.3	9.6	8.8	8.4	8.2	8.3	8.6	9.2	10.1	11.2
Avg. Obs. DO (mg/l)	6.4	7.1	6.8	8.1	8.5	4.6	4.3	4.5	4.9	7.1	7.8	7.2
Available Loading Capacity [NOD]-Low Flow	25,724	32,287	31,329	36,035	44,491	8,124	6,764	6,752	5,137	20,449	23,347	10,806
Available Loading Capacity [NOD]-High Flow	31,229	38,677	36,298	42,035	58,359	15,603	12,919	12,735	9,745	25,064	28,238	18,519
Observed DO Depletion from Saturation (lb/day)-Low Flow	22,135	23,555	23,018	13,667	4,147	10,709	9,873	9,156	9,170	16,063	14,852	7,536
Observed DO Depletion from Saturation (lb/day)-High Flow	26,872	28,217	26,669	15,942	5,439	20,567	18,855	17,269	17,394	19,688	17,964	12,915
DO Deficit below DO Objective [ENOD] (lb/day)- Low Flow	0	0	0	0	0	2,585	3,108	2,404	4,032	0	0	0
DO Deficit below DO Objective [ENOD] (lb/day)-High Flow	0	0	0	0	0	4,965	5,937	4,535	7,649	0	0	0
Estimated Reaeration to R&RI (lb/day)	4,097	3,269	2,747	1,226	243	2,954	3,097	2,923	2,856	1,668	1,763	3,096
Fraction of Load Exerted in DWSC-Low Flow	0.62	0.57	0.47	0.20	0.03	0.35	0.33	0.30	0.38	0.28	0.38	0.47
Fraction of Load Exerted in DWSC-High Flow	0.69	0.61	0.49	0.20	0.03	0.34	0.33	0.32	0.40	0.29	0.40	0.63

Notes: DWSC Voume to R&RI WQ monitoring station is 5000 af
VSS concentration is assumed equal to the ultimate BOD
1 mg/l of Ammonia will deplete 4.7 mg/l of DO
DWSC reaeration is assumed to be (lb/day) = 0.35 m/day * DO deficit (mg/l) * 250 acres * 4047 (m2/acre) /454 (g/lb) = 780 lb/day per mg/l of DO deficit
The load exerted in the DWSC is the observed DO depletion plus the assumed reaeration